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PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1896.

BY PROFESSOR MALCOLM MCNEILL.

SEPTEMBER, 1896.

The Sun crosses the equator and Autumn begins about 5 A.M., P. S. T., September 22d.

Mercury is an evening star throughout the month, and comes to greatest east elongation on the morning of September 13th; but it is also quite far south of the Sun, and the times of setting are not an hour apart. It is, therefore, not in very good position for naked-eye observation. On the afternoon of September 24th it passes a little less than five degrees south of *Venus*, but there is not much chance of seeing it except under very favorable conditions of weather.

Venus is also an evening star, setting not quite an hour after the Sun. It is so much brighter than *Mercury*, that there will be no great difficulty in seeing it. On September 23d it passes about three degrees north of the first-magnitude star *Spica* (*α Virginis*), and *Mercury* is at the same time quite near, two degrees south of *Spica*.

Mars is beginning to get into position for evening observation. By the end of the month it rises before 9:30. It is moving rapidly eastward through *Taurus* from a position about four degrees north of the first-magnitude red star *Aldebaran* (*α Tauri*), on September 1st, to the eastern part of the constellation, on September 30th, about fifteen degrees in all. On September 1st it is distant from the Earth about the mean distance of the Earth from the Sun, ninety-three millions of miles, and at the end of the month it is less than eighty. It is beginning to be much brighter than before, and has become quite a conspicuous object.

Jupiter is a morning star rising more than an hour before the Sun on September 1st, and more than three hours before on September 30th. During the month it moves about six degrees eastward and southward in the constellation *Leo*, and it is quite near the first-magnitude star *Regulus* (α *Leonis*). On the morning of September 19th it passes about twenty minutes, two-thirds of the Moon's apparent diameter, north of the star.

Saturn is still an evening star, setting about two hours earlier than at the corresponding date in August. It moves about three degrees eastward and southward in the constellation *Libra*, and is a little east and south of the principal star of the constellation, α *Libræ*. The rings are apparently a little wider open than in August.

Uranus follows after *Saturn* about five degrees east and three degrees south. It is so low down after sunset that it will not be easy to see, unless in very clear weather.

Neptune is in the constellation *Taurus* in the neighborhood of *Mars*. *Mars* passes about one degree north of it on the morning of September 24th.

OCTOBER, 1896.

Occultations. The Moon passes over the group of the *Pleiades* on the evening of October 23d, and many occultations can be seen from almost any part of the United States, although the eastern part of the country is perhaps a little better situated for observation. The Moon is only two days past full, and the immersions will come at the bright limb, and the emersions at the dark limb.

Mercury passes inferior conjunction with the Sun, and changes from an evening to a morning star, on the afternoon of October 8th. Its apparent distance from the Sun rapidly increases, and it comes to greatest west elongation on the morning of October 24th. From October 20th to the end of the month, it rises nearly an hour and a half before the Sun, and is in pretty good position for observation. At the close of the month it is again near the first-magnitude star *Spica*, about four degrees to the north. The date of nearest approach is October 30th.

Venus is evening star, and sets an hour and one-half later than the Sun at the close of the month. On the afternoon of

October 15th it passes a little more than two degrees south of *Saturn*. It is growing a little brighter, but is not nearly as conspicuous as it is when it is between greatest elongation and inferior conjunction.

Mars rises before 8 P.M. at the close of the month. It is still moving eastward among the stars, but is gradually slowing up, and on November 1st it becomes stationary, ready to begin its westward motion, which it will keep up until after opposition. After the first of the month it is in the western part of the constellation *Gemini*. The distance from the Earth is diminishing rapidly, and at the end of the month it is only a little more than sixty millions of miles, about ten millions greater than it will be at opposition in December. The distance at opposition is considerably greater than during the last two oppositions.

Jupiter is rising earlier, only a little after 1 A.M. at the close of the month. It moves five degrees eastward and southward during the month, and is in the constellation *Leo*.

Saturn is too close to the Sun for good observation. At the end of the month it sets only a little more than half an hour after sunset, and it will be scarcely possible to see it with the naked eye. It will come to conjunction in the middle of November.

Uranus is about four degrees east and south of *Saturn*, and sets only a few minutes later. It is too close to the horizon after sunset to be seen without a telescope.

Neptune rises at about 8 P.M. in the middle of the month. It is in the eastern part of the constellation *Taurus*.

EXPLANATION OF THE TABLES.

The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

PHASES OF THE MOON, P. S. T.

		H. M.
New Moon,	Sept. 7,	5 43 A. M.
First Quarter,	Sept. 13,	8 9 P. M.
Full Moon,	Sept. 21,	2 49 P. M.
Last Quarter,	Sept. 29,	5 58 P. M.

THE SUN.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Sept. 1.	10 44	+ 8 0	5 33 A.M.	12 0	6 27 P.M.
11.	11 20	+ 4 16	5 42	11 56 A.M.	6 10
21.	11 56	+ 0 24	5 52	11 53	5 54
Oct. 1.	12 32	− 3 29	6 0	11 49	5 38

MERCURY.

Sept. 1.	12 12	− 2 19	7 35 A.M.	1 27 P.M.	7 19 P.M.
11.	12 54	− 8 23	7 59	1 30	7 1
21.	13 22	− 12 27	8 2	1 19	6 36
Oct. 1.	13 21	− 12 20	7 20	12 38	5 56

VENUS.

Sept. 1.	11 41	+ 3 27	6 46 A.M.	12 57 P.M.	7 8 P.M.
11.	12 26	− 1 40	7 8	1 2	6 56
21.	13 11	− 6 46	7 31	1 8	6 45
Oct. 1.	13 57	− 11 38	7 54	1 14	6 34

MARS.

Sept. 1.	4 32	+ 20 48	10 33 P.M.	5 47 A.M.	1 1 P.M.
11.	4 53	+ 21 41	10 12	5 30	12 48
21.	5 13	+ 22 21	9 49	5 10	12 31
Oct. 1.	5 30	+ 22 53	9 25	4 48	12 11

JUPITER.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Sept. 1.	9 48	+ 14 5	4 16 A.M.	11 4 A.M.	5 52 P.M.
11.	9 56	+ 13 23	3 46	10 32	5 18
21.	10 4	+ 12 41	3 18	10 1	4 44
Oct. 1.	10 12	+ 12 1	2 48	9 29	4 10

SATURN.

Sept. 1.	14 50	— 14 4	10 52 A. M.	4 4 P.M.	9 16 P.M.
11.	14 53	— 14 20	10 17	3 28	8 39
21.	14 56	— 14 37	9 42	2 52	8 2
Oct. 1.	15 0	— 14 55	9 9	2 17	7 25

URANUS.

Sept. 1.	15 14	— 17 45	11 31 A.M.	4 29 P.M.	9 27 P.M.
11.	15 16	— 17 51	10 53	3 51	8 49
21.	15 17	— 17 57	10 16	3 13	8 10
Oct. 1.	15 19	— 18 5	9 39	2 36	7 33

NEPTUNE.

Sept. 1.	5 18	+ 21 42	11 15 P.M.	6 33 A.M.	1 51 P.M.
11.	5 18	+ 21 42	10 37	5 55	1 13
21.	5 18	+ 21 41	9 58	5 16	12 34
Oct. 1.	5 18	+ 21 41	9 19	4 37	11 55 A.M.

PHASES OF THE MOON, P. S. T.

		H. M.
New Moon,	Oct. 6,	2 18 P. M.
First Quarter,	Oct. 13,	6 47 A. M.
Full Moon,	Oct. 21,	8 17 A. M.
Last Quarter,	Oct. 29,	7 21 A. M.

THE SUN.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Oct. 1.	12 32	— 3 29	6 0 A.M.	11 49 A.M.	5 38 P.M.
11.	13 9	— 7 19	6 12	11 47	5 22
21.	13 46	— 10 59	6 23	11 45	5 7
31.	14 25	— 14 22	6 34	11 44	4 54

Mercury.

1896.	R. A.	Declination.	Rises.	Transits.	Sets.
	H. M.	° ′	H. M.	H. M.	H. M.
Oct. 1.	13 21	− 12 20	7 20 A.M.	12 38 P.M.	5 56 P.M.
11.	12 47	− 6 2	5 44	11 24 A.M.	5 4
21.	12 42	− 2 42	4 50	10 41	4 32
31.	13 25	− 6 46	5 5	10 44	4 23

Venus.

Oct. 1.	13 57	− 11 38	7 54 A.M.	1 14 P.M.	6 34 P.M.
11.	14 45	− 16 3	8 19	1 23	6 27
21.	15 34	− 19 49	8 42	1 32	6 22
31.	16 26	− 22 43	9 6	1 45	6 24

Mars.

Oct. 1.	5 30	+ 22 53	9 25 P.M.	4 48 A.M.	12 11 P.M.
11.	5 44	+ 23 19	8 58	4 22	11 46 A.M.
21.	5 53	+ 23 44	8 27	3 53	11 19
31.	5 57	+ 24 10	7 50	3 18	10 46

Jupiter.

Oct. 1.	10 12	+ 12 1	2 48 A.M.	9 29 A.M.	4 10 P.M.
11.	10 19	+ 11 22	2 18	8 57	3 36
21.	10 26	+ 10 46	1 47	8 24	3 1
31.	10 32	+ 10 13	1 16	7 51	2 26

Saturn.

Oct. 1.	15 0	− 14 55	9 9 A.M.	2 17 P.M.	7 25 P.M.
11.	15 4	− 15 14	8 35	1 42	6 49
21.	15 9	− 15 33	8 1	1 7	6 13
31.	15 13	− 15 53	7 28	12 32	5 36

Uranus.

Oct. 1.	15 19	− 18 5	9 39 A.M.	2 36 P.M.	7 33 P.M.
11.	15 21	− 18 13	9 3	1 59	6 55
21.	15 24	− 18 21	8 26	1 22	6 18
31.	15 26	− 18 30	7 50	12 45	5 40

Neptune.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Oct. 1.	5 18	+21 41	9 19 P.M.	4 37 A.M.	11 55 A.M.
11.	5 18	+21 40	8 39	3 57	11 15
21.	5 17	+21 39	7 59	3 17	10 35
31.	5 17	+21 38	7 19	2 37	9 55

MARS, BY PERCIVAL LOWELL.

By W. W. Campbell.

Boston: Houghton, Mifflin & Co., 1895; 8vo, pp. 228+VIII, XXIV Illustrations.

[Reprinted from the original in *Science.*]

I am pleased to comply with the Editor's request for a review of Mr. Lowell's interesting book.

The reviewer of a work on organic evolution would find it difficult to avoid mentioning Darwin. Schiaparelli holds a similar place in the literature of *Mars.* An intelligent criticism of any recent book on *Mars* must consist largely of a review of Schiaparelli's observations and ideas. Of his predecessors it will be well to mention, for the benefit of non-astronomical readers, the following: (*a*) Galileo (1610), who discovered the phases of the planet, thereby proving that its light, though very red, is really reflected sunlight; (*b*) Huyghens (1659), who first observed markings on the surface; (*c*) Cassini (1666), who determined the length of the Martian day, and discovered the white polar caps; (*d*) Sir Wm. Herschel (1783), who observed the waxing and waning of the polar caps with the seasons; (*e*) Beer and Maedler, who published the first map of the planet's surface features, and discovered at least three of the so-called canals; (*f*) Dawes (1864), whose drawings show a dozen of the canals; and (*g*) Hall (1877), who discovered the two satellites.

Schiaparelli's work extends continuously from 1877 on. It is impossible to do justice to his labors in this article. He extended our knowledge of the planet enormously in nearly every line—in reference to the polar caps, the so-called seas and con-